

Claims

[c1] 1. A bi-directional curing process for preparing an at least partially cured, essentially nonporous, low warpage gel coat, the process comprising the steps of:

- A. Applying an uncured gel coat to a nonporous mold, the mold at least partially transparent to actinic radiation, the uncured gel coat (i) comprising a polymeric composition that cures upon exposure to actinic radiation, and (ii) having a first surface in contact with a surface of the nonporous mold, and a second surface opposite the first surface and open to the environment;
- B. Exposing the first surface of the uncured gel coat to actinic radiation from a first source, the first source located such that the actinic radiation must pass through the nonporous mold to effect an at least partial cure of the gel coat; and
- C. Simultaneously or shortly following step (B), exposing the second surface of the gel coat to actinic radiation from a second source, the second source of the actinic radiation located such that the actinic radiation does not pass through the nonporous mold to effect the at least partial cure of the gel coat.

[c2] 2. The process of Claim 1 in which the mold is a casting plastic film.

[c3] 3. The process of Claim 2 in which the casting plastic film comprises a polyester resin.

[c4] 4. The process of Claim 2 in which the actinic radiation is at least one of infrared, visible and ultraviolet light radiation.

[c5] 5. The process of Claim 2 in which the actinic radiation comprises ultraviolet light.

[c6] 6. The process of Claim 5 in which both the first and second sources of ultraviolet light are mercury lamps.

[c7] 7. The process of Claim 6 in which the first mercury lamps are located beneath the film and the second mercury lamps are located above the film and downstream of the first mercury lamps.

[c8] 8.The process of Claim 1 in which the gel coat comprises a resin selected from the group consisting of an acrylic resin, an unsaturated polyester resin and mixtures of an acrylic resin and an unsaturated polyester resin.

[c9] 9.The process of Claim 7 in which the gel coat comprises a resin selected from the group consisting of an acrylic resin, an unsaturated polyester resin and mixtures of an acrylic resin and an unsaturated polyester resin.

[c10] 10.The process of Claim 7 comprising the additional step of applying a reinforcing lamination to the second surface of the at least partially cured gel coat, the reinforcing lamination (i) comprising a resin in combination with a reinforcing fiber, and (ii) having a first surface in intimate contact with the second surface of the at least partially cured gel coat and a second surface opposite the first surface and open to the environment.

[c11] 11.The process of Claim 10 in which the resin of the reinforcing lamination comprises the same resin as the gel coat and the reinforcing fiber is at least one of fiberglass or a plastic.

[c12] 12.The process of Claim 10 comprising the additional step of exposing the second surface of the reinforcing laminate to actinic radiation from a third source, the third source located above the second surface of the laminate and downstream of the second source of actinic radiation.

[c13] 13.The process of Claim 12 comprising the additional step of overlaying the reinforcing lamination with a cover plastic film.

[c14] 14.The process of Claim 13 in which the cover plastic film is of the same composition as the casting plastic film.

[c15] 15.The process of Claim 12 comprising the additional step of overlaying the reinforcing laminate with a cover plastic film that is at least partially transparent to actinic radiation prior to exposing through the cover plastic film the second surface of the reinforcing laminate to actinic radiation from the third source.

[c16] 16.The process of Claim 7 comprising the additional step of overlaying the gel coat with a cover plastic film that is at least partially transparent to actinic

radiation before exposing the gel coat to the first source of actinic radiation.

- [c17] 17.The process of Claim 7 comprising the additional step of overlaying the at least partially cured gel coat with a cover plastic film that is soluble in the reinforcing resin prior to cure.
- [c18] 18.The process of Claim 17 comprising the additional step of collecting the at least partially cured gel coat onto a take-up reel.
- [c19] 19.The process of Claim 16 comprising the additional step of collecting the at least partially cured gel coat onto a take-up reel.
- [c20] 20.An essentially nonporous, at least partially cured gel coat as prepared by the process of Claim 1.
- [c21] 21.An essentially nonporous, at least partially cured gel coat as prepared by the process of Claim 10.
- [c22] 22.An essentially nonporous, at least partially cured gel coat as prepared by the process of Claim 15.
- [c23] 23.An essentially nonporous, at least partially cured gel coat as prepared by the process of Claim 16.
- [c24] 24.An essentially nonporous, at least partially cured gel coat as prepared by the process of Claim 17.
- [c25] 25.An essentially nonporous, at least partially cured gel coat as prepared by the process of Claim 18.
- [c26] 26.An essentially nonporous, at least partially cured gel coat as prepared by the process of Claim 19.
- [c27] 27.A process for preparing an at least partially cured, essentially nonporous gel coat, the process comprising the steps of:
 - A. Applying an uncured gel coat to a nonporous mold, the mold at least partially transparent to actinic radiation, the uncured gel coat (i) comprising a polymeric composition that cures upon exposure to actinic radiation, and (ii) having a first

surface in contact with a surface of the nonporous mold, and a second surface opposite the first surface and open to the environment; and

B. Exposing the first surface of the uncured gel coat to actinic radiation from a source located such that the actinic radiation must pass through the nonporous mold to effect an at least partial cure of the gel coat.

- [c28] 28.The process of Claim 27 in which the mold is a plastic film.
- [c29] 29.The process of Claim 28 in which the plastic film comprises a polyester resin.
- [c30] 30.The process of Claim 28 in which the actinic radiation is at least one of infrared, visible and ultraviolet light radiation.
- [c31] 31.The process of Claim 30 in which the actinic radiation comprises ultraviolet light.
- [c32] 32.The process of Claim 27 in which the uncured gel coat comprises a resin selected from the group consisting of an acrylic resin, an unsaturated polyester resin and mixtures of an acrylic resin and an unsaturated polyester resin.
- [c33] 33.An essentially nonporous, at least partially cured gel coat as prepared by the process of Claim 27.
- [c34] 34.The process of Claim 1 in which the cure of the gel coat is augmented with thermal energy.
- [c35] 35.The process of Claim 27 in which the cure of the gel coat is augmented with thermal energy.

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